"KENNEDY APPROACH..."

STANDARD OPERATING PROCEDURES FOR AIR TRAFFIC CONTROL

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CHANGE 1

A note from the designer…

Dear Friend,

When considering the vast network that makes up our Air Traffic Control System, I was challenged by the opportunity of bringing to life on your home computer the unique job of being an air traffic controller.

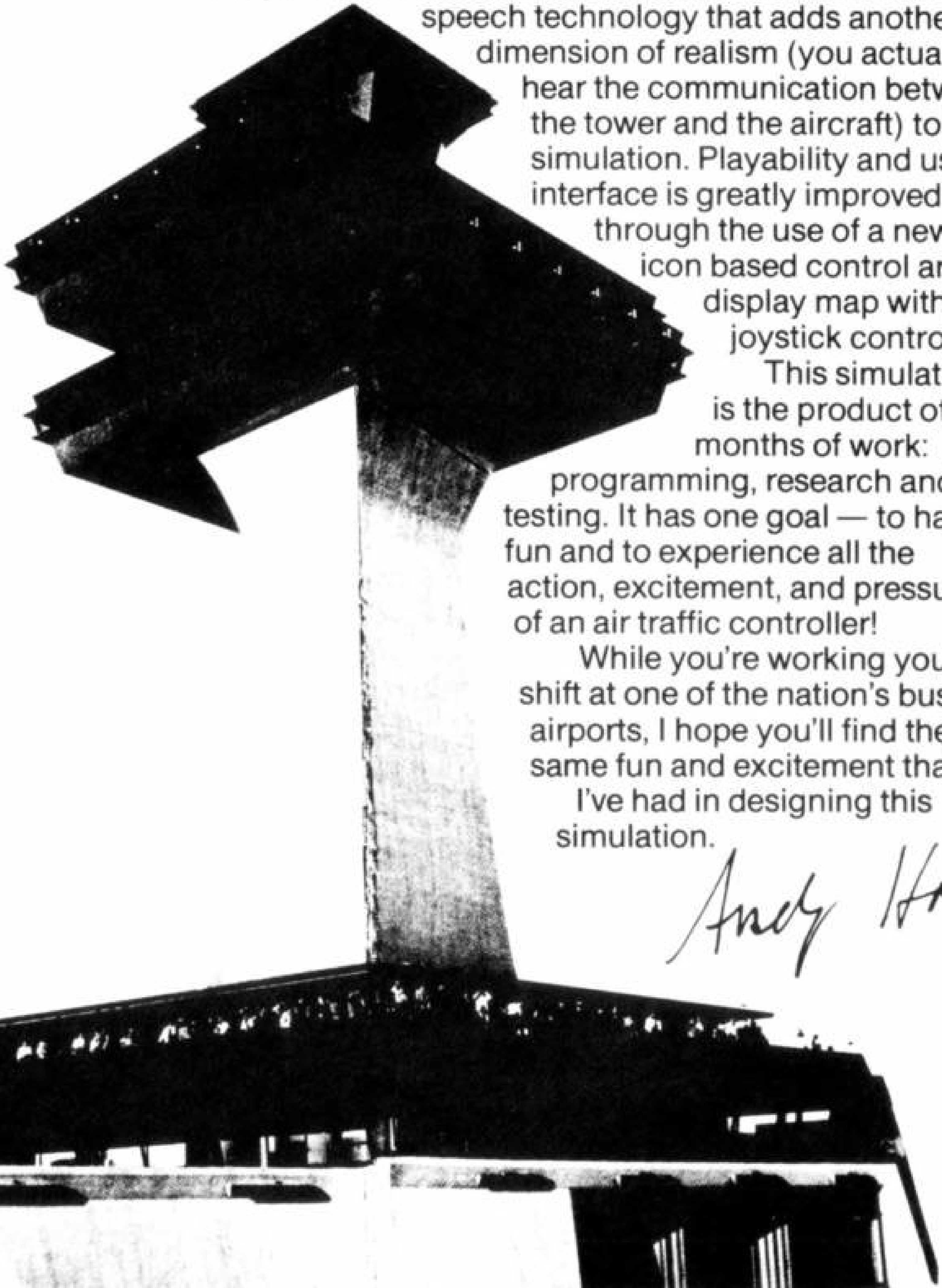
Developing an easy to use, and frankly, the most realistic simulation available, turned out to be a challenging and highly enjoyable task.

I designed this simulation with state-of-the-art software speech technology that adds another dimension of realism (you actually hear the communication between the tower and the aircraft) to the simulation. Playability and user interface is greatly improved through the use of a new icon based control area display map with joystick control.

This simulation is the product of months of work: programming, research and testing. It has one goal — to have fun and to experience all the action, excitement, and pressure of an air traffic controller!

While you're working your shift at one of the nation's busiest airports, I hope you'll find the same fun and excitement that I've had in designing this simulation.

Andy Hollis



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MICROPROSE
SIMULATION • SOFTWARE

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Software by Andy Hollis

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Apple Computer Inc., and International Business Machines, Inc.
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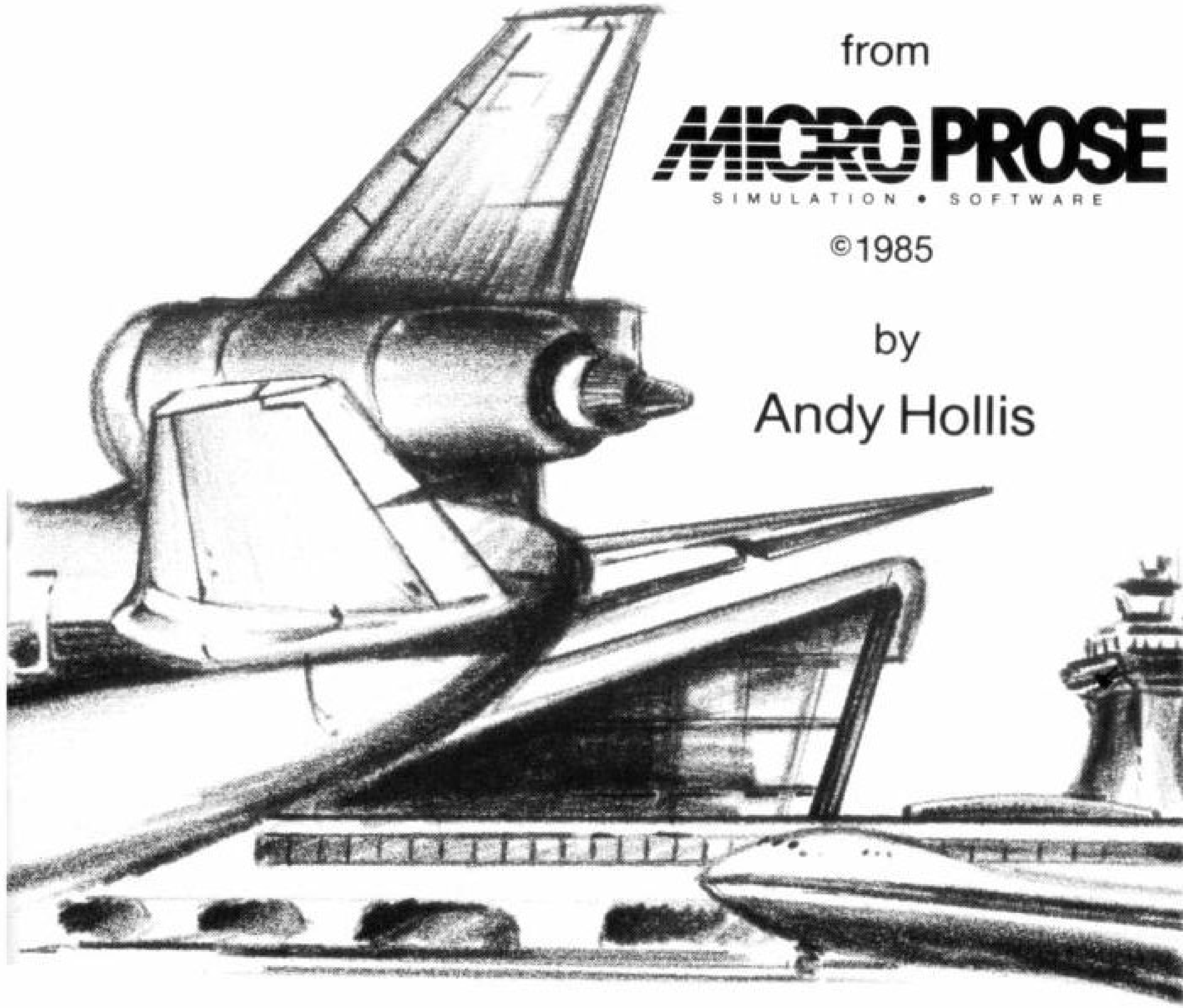
STANDARD OPERATING PROCEDURES

"KENNEDY APPROACH"

AIR TRAFFIC CONTROL SIMULATION



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MICRO PROSE

SIMULATION • SOFTWARE

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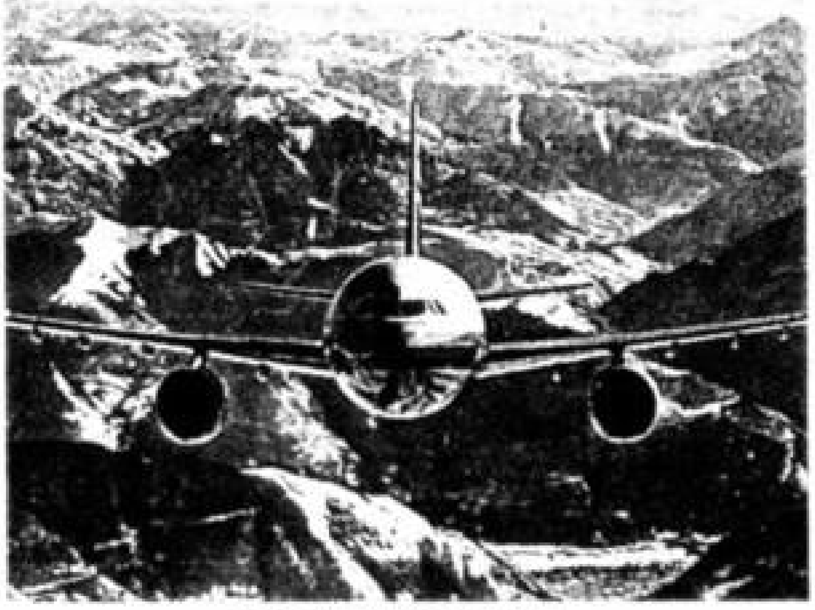
by

Andy Hollis

I PROGRAM MANUAL

A. OVERVIEW



BOEING 757

Air Traffic Control is one of the world's most demanding professions. Every minute in the tower a Controller is called on to make life or death decisions for thousands of passengers and crewmembers. He or she must control a constantly changing situation; monitoring flight departures and arrivals; guiding planes around bad weather, mountainous terrain, and restricted flight areas; coping with fuel emergencies, slow planes, and fast jets (including the supersonic Concorde). In this fast-moving environment, even the slightest miscalculation can lead to a dangerous near-miss or mid-air disaster! Air traffic control is not for everybody; to succeed you must have superb concentration, quick wits, and nerves of steel.

KENNEDY APROACH gives you a chance to test your mettle. How well can you handle the pressure and responsibility? Learn the ropes by working the graveyard shift at Atlanta International, and then work your way up to prime time at John F. Kennedy International. Happy Landings!

B. LOADING INSTRUCTIONS

1. COMMODORE 64

The joystick should be placed in joystick port #2 (nearest the back of the computer).

Place the program diskette in your disk drive. Type LOAD "★", 8, 1. The program will boot automatically. Leave the disk in the drive.

2. ATARI 400/800/1200/800XL/130XE REMOVE ALL CARTRIDGES

Place the program diskette in your disk drive and turn on your computer. The program will boot automatically. Leave the disk in the drive.

The joystick should be placed in joystick port #1 (nearest the back of the computer).

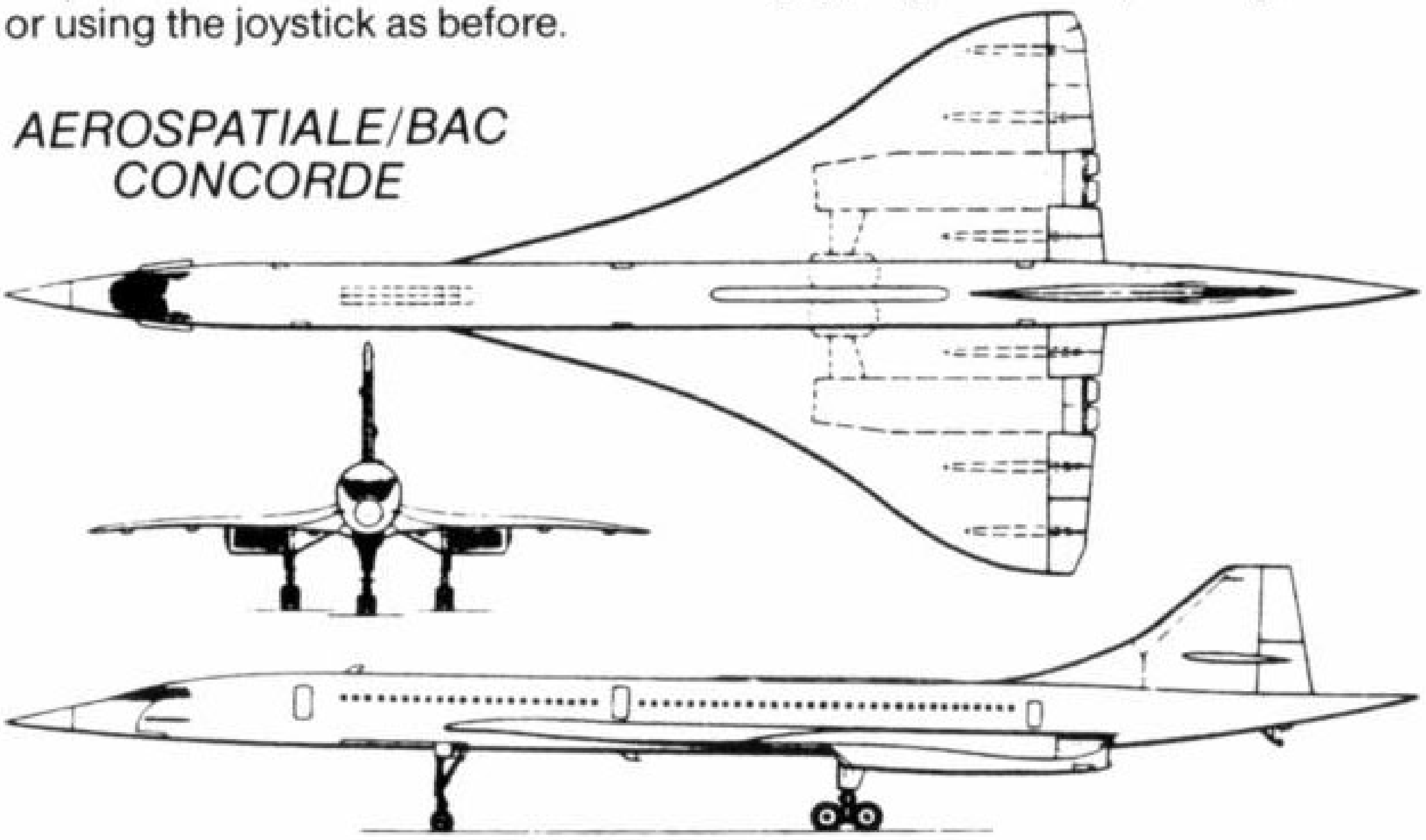
NOTE: Make sure to turn up the volume control on your TV or monitor. You'll automatically be tuned in to the Air Traffic Control radio frequency.

C. OPTIONS

When the simulation has loaded, you will first see the main option screen. Here you can select between showing a demo (type "D"), showing an instant replay of a scenario that you have previously saved on your own disk (type "R"), or playing a new game. If no selection is made within 60 seconds, a demo is shown automatically.

To play a new game you must select a skill level from 1 (easiest) to 5 (most difficult). It is a good idea to start with the easy levels in order to gain experience with the simulation. The more difficult levels will put you right into heavy traffic situations with no margin for error. The level is selected by typing a number from 1 to 5 or by moving the joystick up or down and pressing the trigger.

Once you have chosen a skill level you will be offered a choice among several cities at which to work. The selection presented to you is dependent on the skill level you have chosen. The different metropolitan regions are described in the map section of this manual. Choose one by typing the corresponding number or using the joystick as before.



AEROSPATIALE/BAC
CONCORDE

D. CONTROL TOWER ACCESS CODES

Before your first shift, you must enter the proper password in order to log on to the air traffic control computer system. The computer will present you with a number, and you must consult the password tables located throughout this manual for the word that corresponds to it for your computer.

It is very important to get the correct password for your computer in order to gain access to the system. Type the access code, press RETURN, and you're ready for your first shift as an air traffic controller.

FOR EXAMPLE: If the computer displays "ENTER COMPUTER ACCESS CODE NUMBER 1" you would consult the Computer Access Code Box below and type in the letters DME and press RETURN.

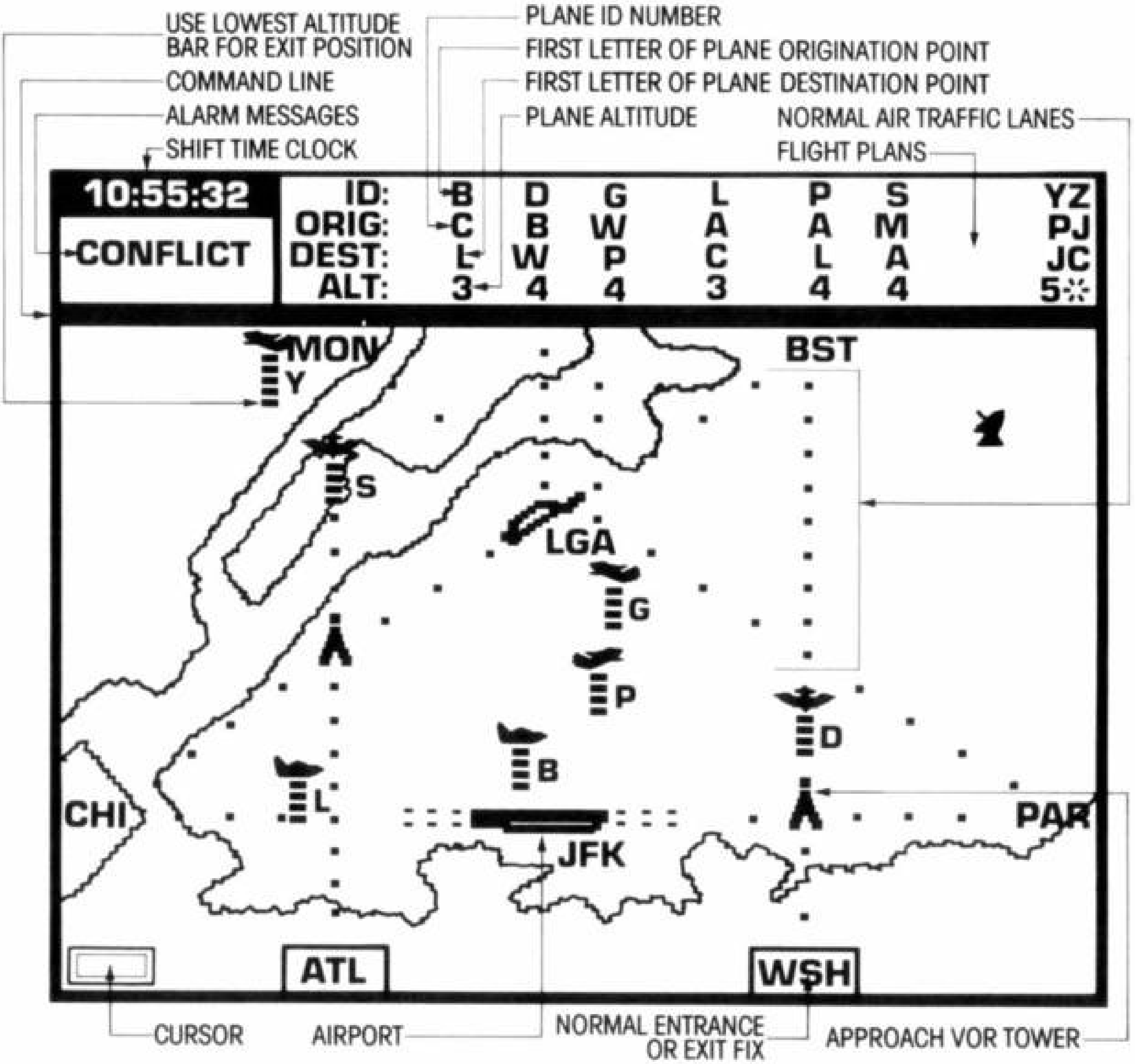
COMPUTER ACCESS CODE			
	COMPUTER ACCESS CODE NUMBER	1	2
RESPONSE	C-64	DME	VOR
	ATARI	FAF	ADF

IMPORTANT: If you do not enter the correct response, the simulation will display an error message and you will be unable to control the aircraft in the simulation.

II STANDARD OPERATING PROCEDURES

A. VISUAL DISPLAY

1. CONTROL AREA MAP: The largest section of the simulation display is the Control Area Map. The Control Area Map is designed to provide you with the state of the art computer graphic representation of the information provided real air traffic controllers. Kennedy Approach's display improves on the old technology, round radar screens, by providing pseudo 3-dimensional icons of aircraft with direction, altitude, and flight path information for the entire area you are controlling on one integrated screen.



(1) THE DOT GRID: A grid of dots one mile apart is superimposed over the ground to aid in navigation. The bright dots denote normal air traffic lanes.

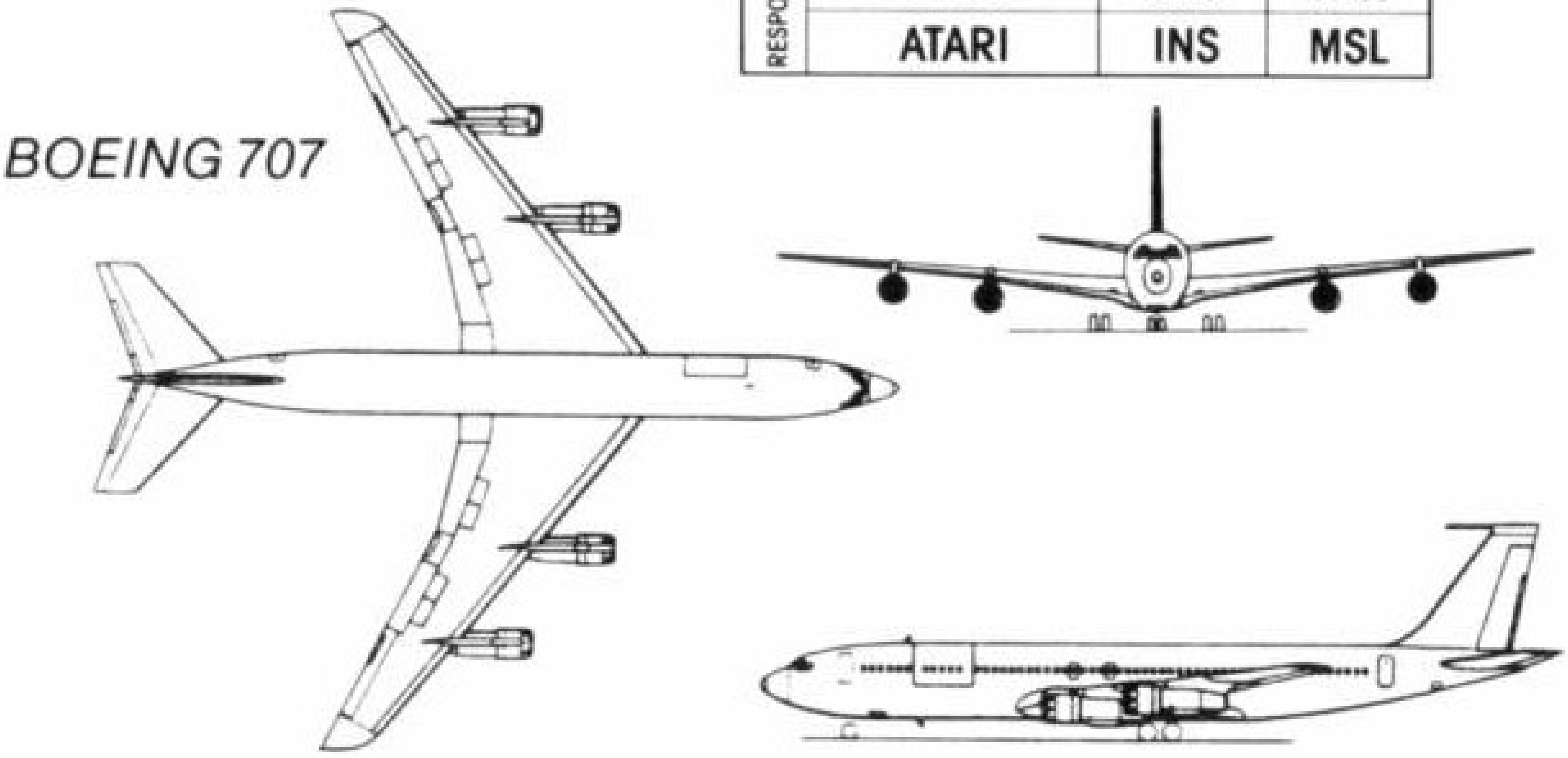
(2) AIR TRAFFIC FEATURES: Entrance and exit fixes (places where aircraft routinely enter and leave your area) are labelled, as are airports. On the approach side of each airport is a VOR tower. Incoming planes hold (circle) around this until they are cleared to land. Aircraft that are landing must approach from this direction.

(3) THE PLANES: There are three types of aircraft in KENNEDY APPROACH: light planes, jet airliners, and the supersonic Concorde. Light planes are smaller than jet airliners, and the Concorde is distinguishable by its drop-nose and delta wings. The direction a plane is pointing indicates its direction of travel (which will always be one of the eight primary points of the compass: North, Northeast, East, etc.). Below the plane are bars indicating current altitude in thousands of feet, and to the right is the plane's ID letter.

(4) TERRAIN FEATURES: Also on the map are mountains, storms, and restricted zones. Planes must maintain an altitude of at least four thousand feet over the mountains, and they should avoid storms and restricted zones altogether.

COMPUTER ACCESS CODE

	COMPUTER ACCESS CODE NUMBER	3	4
RESPONSE	C-64	ATC	FAR
	ATARI	INS	MSL



BOEING 707

2. THE COMMAND LINE: Just above the Control Area Map is the Command Line. Here, messages are displayed as they are radioed between you and the aircraft in your area. When you use the joystick to direct traffic (as explained in section B) you will see your commands written out, and you will then see the pilot's response.

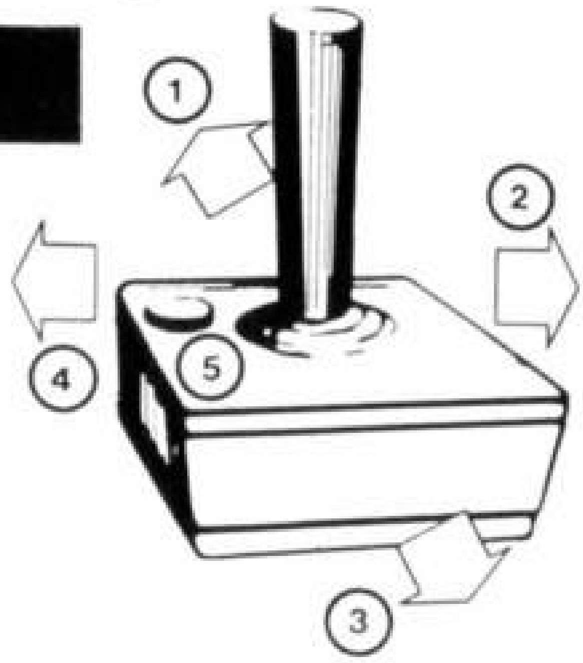
3. FLIGHT PLANS: In the upper right-hand section of the screen are the Flight Plans for the active aircraft in your area. The uppermost letter in each column is a plane's ID letter, corresponding to the ID on the Control Area Map. Below the ID is the first letter of the origin and the first letter of the destination fix or airport for that plane. Below these is the altitude in thousands of feet. Aircraft that are waiting to take off have a "✱" in the altitude field.

4. THE CLOCK: In the upper left-hand corner of the screen is the time-of-day clock. Your shift ends on the hour. The passage of time in the simulation is measured in real-time. In other words, the time pressures you experience correspond exactly to those experienced by real air traffic controllers. Time can be accelerated by holding down the SPACE BAR while the simulation is operating.

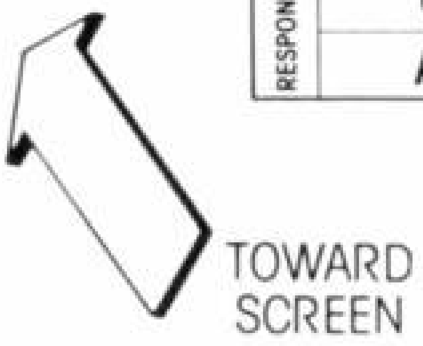
5. ALARM AREA: Between the clock and the Command Line is the alarm area. Dangerous situations are reported here. These include incorrect exit altitudes and fixes, conflicts, and crashes.

B. AIRCRAFT COMMUNICATIONS

As Air Traffic Controller, you direct the flight paths of all planes in your area. You must give precise instructions to each pilot indicating turns and altitude changes. Planes will fly straight and level unless otherwise instructed. You may direct the activities of any aircraft in your area by establishing contact with it, entering the Command Mode and issuing instructions.



COMPUTER ACCESS CODE			
	COMPUTER ACCESS CODE NUMBER	5	6
RESPONSE	C-64	IAP	GCA
	ATARI	VHF	TCA



1. ESTABLISHING CONTACT: You can establish contact with a plane in one of two ways. One way is to type in the plane's ID letter, as displayed on the Control Area Map. The other way is use the joystick to move the cursor (the white rectangular box near the center of the map) over the plane, and then give the joystick button a short push (less than one second).

2. ENTERING THE COMMAND MODE: Whichever method of establishing contact you use, you will automatically enter the Command Mode. To confirm this the image of the plane will turn into an arrow, the flight plan for that plane will turn white, and text will be displayed in the Command Line.

3. ISSUING COMMANDS: To tell the pilot what direction you want the plane to fly, move the joystick left (4) or right (2) until the arrow points in that direction. To specify the altitude at which you want the pilot to fly, move the joystick up (1) or down (3) until the altitude bars under the arrow indicate the proper altitude. **PLEASE NOTE IMPORTANT: Each bar indicates 1000 feet of altitude, and the ACTUAL POSITION of the plane is represented not by the ICON, but by the BOTTOM BAR.** As you select the heading and altitude, the text on the command line will reflect the appropriate command. A short push on the joystick button and you will hear your command radioed to the pilot and hear his "Roger" response. You can now watch the Control Area Map to see as the pilot begins to make the altitude and heading changes you gave.

4. EXITING THE COMMAND MODE: Once you issue a command (which always consists of both heading and altitude instructions), you will automatically leave the Command Mode. Note that these latest commands will override any previous instructions. If you want to exit the Command Mode without issuing a new set of instructions, simply give the joystick button a long push (greater than 1 second): the arrow will disappear and the plane will reappear.

5. STATUS: When the skies become crowded it is often difficult to remember what instructions you have given to each plane. You can ask a pilot for his status by selecting the plane with the cursor and giving a long push (greater than

1 second) on the joystick button. Watch the command line and listen for his response.

6. ADDITIONAL COMMANDS: To pause the simulation, press the F1 key. (OPTION KEY - ATARI) To end the simulation and return to the main option screen, press the F7 key. (START KEY - ATARI)

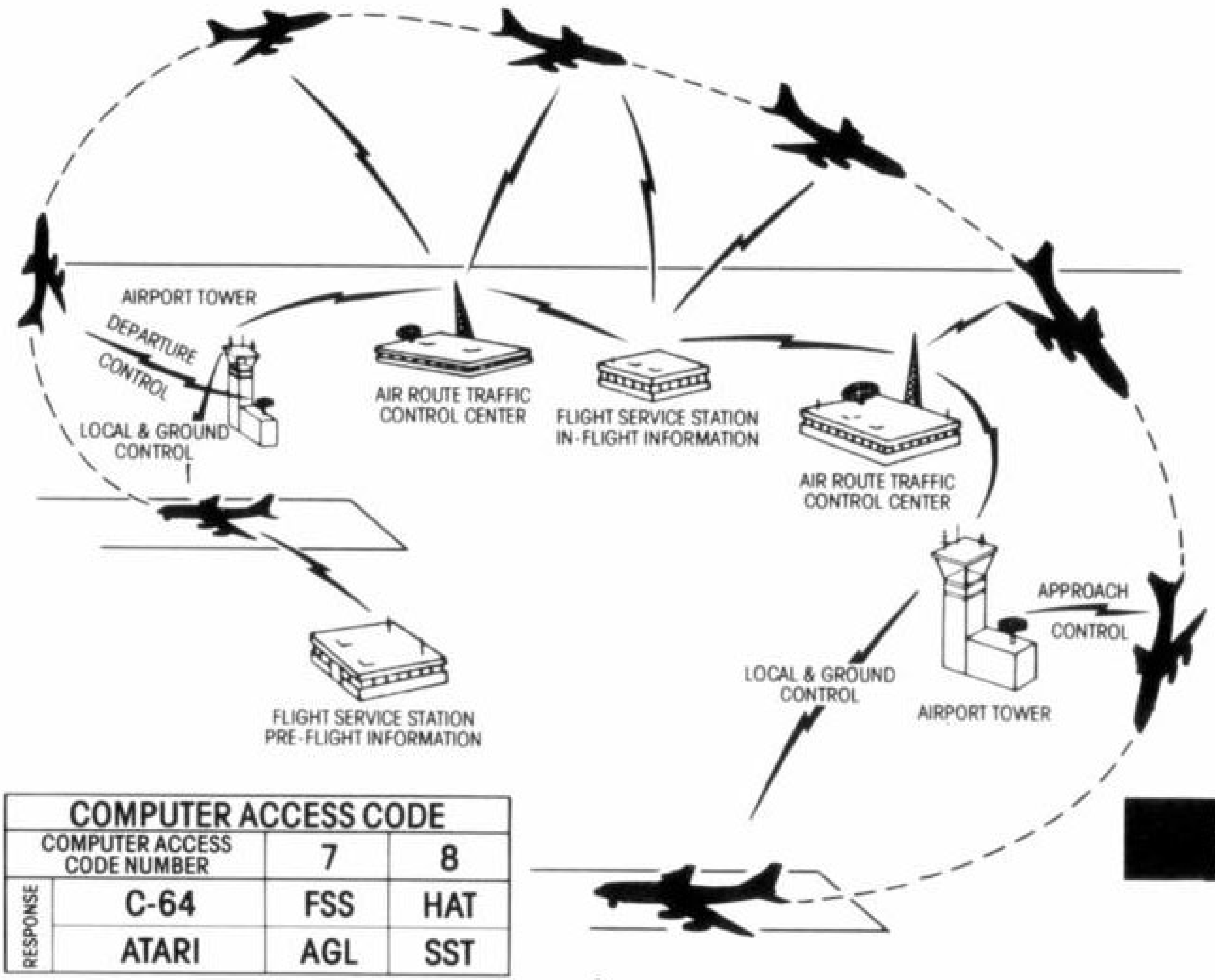
C. AIR TRAFFIC CONTROL

1. INCOMING AIRCRAFT: Some aircraft will enter your control area from an adjacent area. The flight plan for each incoming aircraft is posted one minute before the plane becomes active in your area. When the plane enters your area, the flight plan changes color from grey to black (yellow to black for ATARI), and the plane appears. It now awaits your instructions to complete its flight plan. Incoming aircraft will always enter the area at an altitude of five thousand feet.

2. TAKE OFFS: Flights departing from airports in your area will post their flight plans one minute before they are ready for take-off. The flight plan will have a "★" in the altitude field and will turn black when the aircraft is ready.

To give clearance for take-off, type the plane's ID letter on the keyboard to enter Command Mode. Now use the joystick to instruct the pilot to climb to the desired altitude as described in section B3. Remember not to start a take-off when another plane is landing!

AIR TRAFFIC CONTROL SYSTEM


AIRPORT TOWER
DEPARTURE
CONTROL
LOCAL & GROUND CONTROL
AIR ROUTE TRAFFIC CONTROL CENTER
FLIGHT SERVICE STATION IN-FLIGHT INFORMATION
AIR ROUTE TRAFFIC CONTROL CENTER
APPROACH
CONTROL
LOCAL & GROUND CONTROL
AIRPORT TOWER
FLIGHT SERVICE STATION PRE-FLIGHT INFORMATION

COMPUTER ACCESS CODE			
	COMPUTER ACCESS CODE NUMBER	7	8
RESPONSE	C-64	FSS	HAT
	ATARI	AGL	SST

3. LANDING: Aircraft destined for an airport must be landed by heading the plane down the runway and giving it clearance for landing (altitude 0). Aircraft that have been cleared for landing and have reached altitude 0 can no longer be given turn commands. Remember, aircraft must land on the runway from the arrival side of the airport as denoted by the VOR tower. See the screen display diagram.

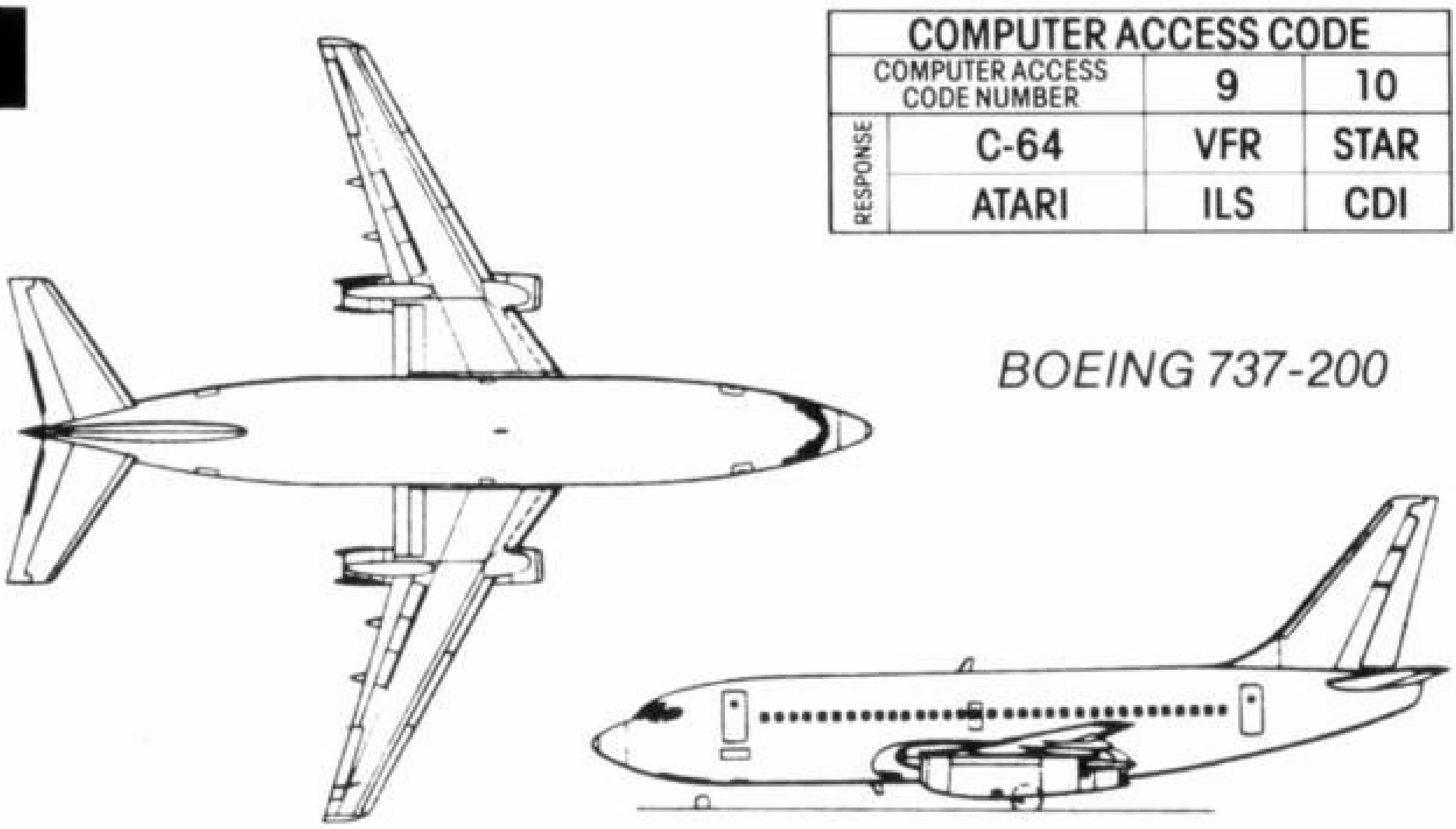
4. HOLDING: Since only one aircraft can use a runway at a time, it may be necessary to put other planes into a holding pattern. A hold is a continuous full turn around a VOR tower at a particular altitude in either a clockwise (hold right) or counter-clockwise (hold left) direction. An incoming plane scheduled to land will automatically hold at the VOR tower until cleared to land.

At times you will need to instruct a pilot to enter or maintain a holding pattern. To do this, enter Command Mode and push the joystick in the desired direction (left or right) until the "hold" symbol appears over the plane on the Control Area Map and the command line says "Hold at VOR". Then, while still holding the joystick left or right, give the joystick button a short push and the command will be given. This command usually accompanies an altitude change command for a landing aircraft.

5. EXITING THE CONTROL AREA: An aircraft that does not land in your area must leave via the exit fix indicated in its flight plan. All such aircraft must exit at an altitude of four thousand feet.

COMPUTER ACCESS CODE

	COMPUTER ACCESS CODE NUMBER	9	10
RESPONSE	C-64	VFR	STAR
	ATARI	ILS	CDI



BOEING 737-200

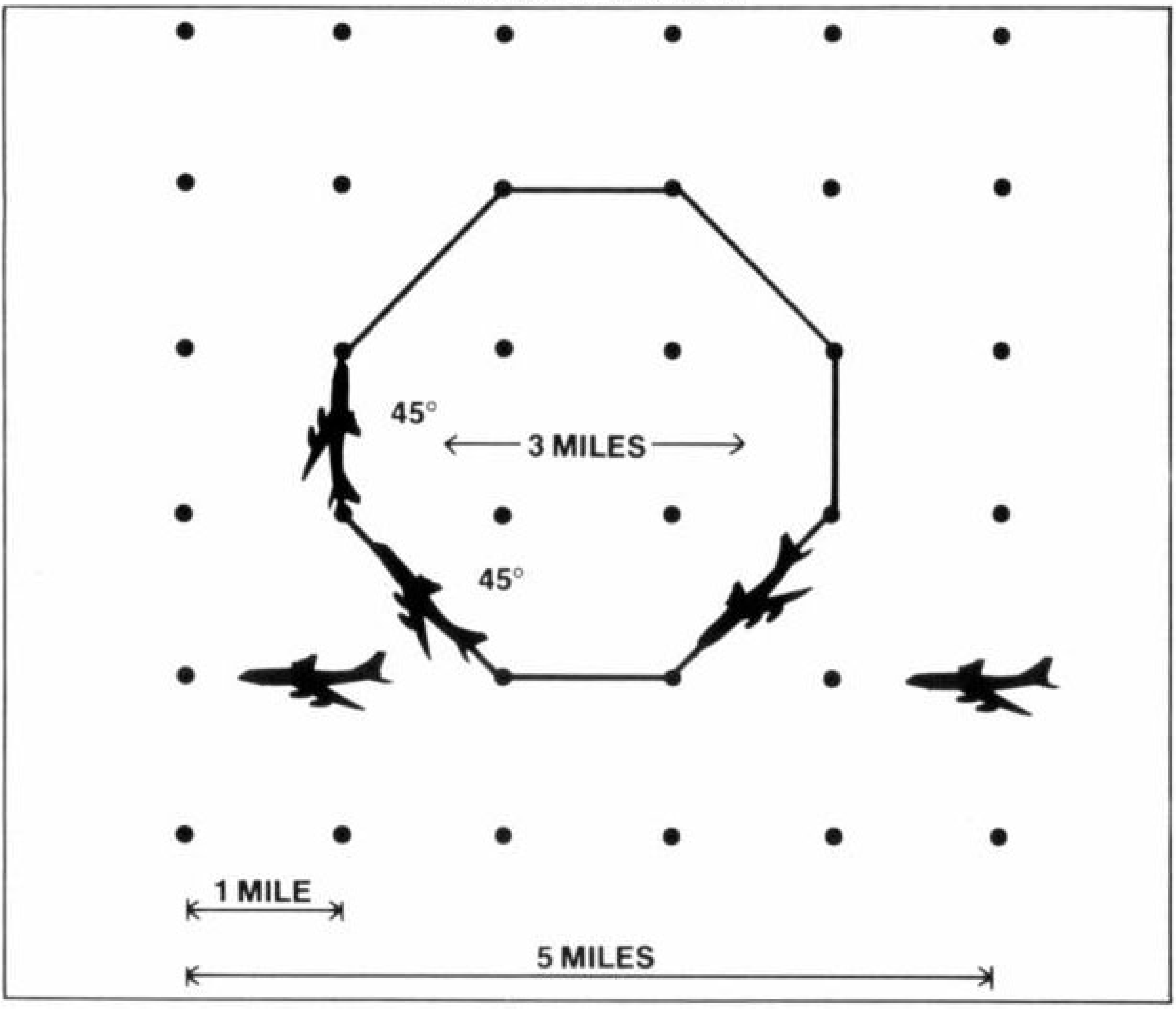
D. SIMULATION AIRCRAFT CHARACTERISTICS

1. SPEED: The various types of aircraft travel at different speeds. Light planes move two miles (2 grid dots) every minute, jets move 4 miles every minute, and the Concorde moves 8 miles every minute.

2. ALTITUDE CHANGES: All of the planes have a climb/descent rate of one thousand feet per mile (grid dot).

3. TURNS: All three types of plane have a turning radius of 1.5 miles. This gives an effective turn angle of 45 degrees per grid dot. See the turning diagram.

TURNING DIAGRAM



To make a 360 degree turn requires a 3 mile diameter and eight 45 degree turns that can be accomplished at each grid dot.

E. INFLIGHT RESTRICTIONS

COMPUTER ACCESS CODE			
	COMPUTER ACCESS CODE NUMBER	11	12
RESPONSE	C-64	SID	IFR
	ATARI	VFR	HSI

In order for air traffic to proceed safely through your area several requirements must be met.

1. AIRCRAFT SEPARATION: The first and foremost of these requirements is aircraft separation. You must maintain a one thousand foot separation in altitude between aircraft flying within three miles of each other. Note that planes may fly within three miles of each other if they are separated by at least 1000 feet, or they may fly at the same altitude if they are at least three miles apart. Failure to meet the aircraft separation requirements will result in a "conflict" condition and a possible mid-air crash.

2. BAD WEATHER: Occasionally severe weather (thunderstorms) will move through the area. Planes must avoid this or they will crash.

3. MOUNTAINS: A plane will also crash if it does not maintain an altitude of at least four thousand feet over mountainous areas.

4. RESTRICTED ZONES: Planes must risk being shot down by nervous security personnel if they overfly the Washington Monument/White House.

5. FUEL: Planes carry a limited amount of fuel and will run out if delayed excessively. Planes that are landing at airports in your area have only fifteen

minutes fuel from the time they enter the area. All other planes start with 60 minutes of fuel. When a plane's fuel supply gets below eight minutes it will contact you and declare an emergency. You should direct the plane to land at the nearest airport for refueling. If you allow a plane with a fuel emergency to exit your control area, you will disrupt the air traffic in the adjoining areas, which will cause incoming planes to have low fuel. Occasionally, on the higher skill levels, you may get aircraft entering your area already with low fuel emergencies.

COMPUTER ACCESS CODE

	COMPUTER ACCESS CODE NUMBER	13	14
RESPONSE	C-64	TDZ	PAR
	ATARI	OCA	MDA

F. CONTROLLER EVALUATION

When your shift ends (on the hour), you will be given one month's salary based on your current GS rating and bonus pay based on your performance. $100 is paid for each flight completion, $200 is paid for each successful emergency landing, and $100 is subtracted for each minute of flight delay caused.

Should you commit a major error, the game (and your career as an Air Traffic Controller) will be over. Major errors include: 1) crashes, 2) bad exits, 3) letting a plane with an emergency leave your area, 4) conflict time greater than one minute, or 5) flight delay time greater than 45 minutes.

If you commit no major errors and your conflict time is less than 30 seconds, you will be promoted to the next GS rating.

At this point you have the option to: (1) go on to your next shift, (2) show an instant replay of the scenario just completed, (3) save the previous scenario to disk for later replay, or (4) go back to the main option screen. As before, your option is selected by typing the appropriate number or moving the joystick and pressing the trigger.

G. TIPS FOR BETTER PLAY

1) Plan ahead. Watch the flight plan area for the next plane to become active and decide what to do with it before it enters your area. When it enters your area, give it the appropriate command as soon as possible.

2) Use as few commands as possible to complete a flight plan. The air traffic lanes are set up so that most flight plans can be completed with a single altitude and heading change.

3) Stay at skill level one until you become proficient. Air traffic increases with the skill level, causing conflicts for the inexperienced player. The constant noise of the conflict warning is quite annoying.

4) Use altitude as well as spacing to avoid conflicts. Planes in a holding pattern can be stacked at different altitudes, landing them one at a time and shifting the others down. Remember to start the descent commands with the lowest aircraft first.

5) Stacking can be used in takeoffs to get many planes off the ground in a short period of time. The first plane is commanded to climb to four thousand feet, the next plane to three thousand feet, etc. This maintains the required one thousand foot separation even though all planes are climbing.

6) Handle takeoffs and landings in groups. That is, do a series of takeoffs, then a series of landings. It is very difficult to mix the two without causing a conflict.

7) When the skies get crowded, delay the takeoffs. It is much better to have flight delays than to have conflicts or bad exits. Delaying light plane takeoffs is especially useful since they move slowly.

8) Remember, the bottom of the altitude bars represents the plane's position over the ground. It is this part of the plane picture that must pass over the exit fix for a proper exit.

III CONTROL AREAS WITH MAPS

COMPUTER ACCESS CODE

	COMPUTER ACCESS CODE NUMBER	15	16
RESPONSE	C-64	NDB	ELT
	ATARI	ASR	IAF

A. ATLANTA, GEORGIA

The central feature of this area is the William B. Hartsfield Atlanta International Airport. Air traffic here consists entirely of jets, with equal numbers of departures, arrivals, and transits. Weather is always good and the terrain is basically flat.

B. DALLAS-FORT WORTH, TEXAS

Here we have the extremely busy Dallas Fort Worth International Airport (DFW) and the bothersome Dallas Love Field. With the large volume of departures and arrivals here, flight delays can be disastrous. And just when you get all of the jets sorted out, up come some light planes from Love Field! Fortunately, the weather is usually okay here and the terrain is flat.

C. DENVER, COLORADO

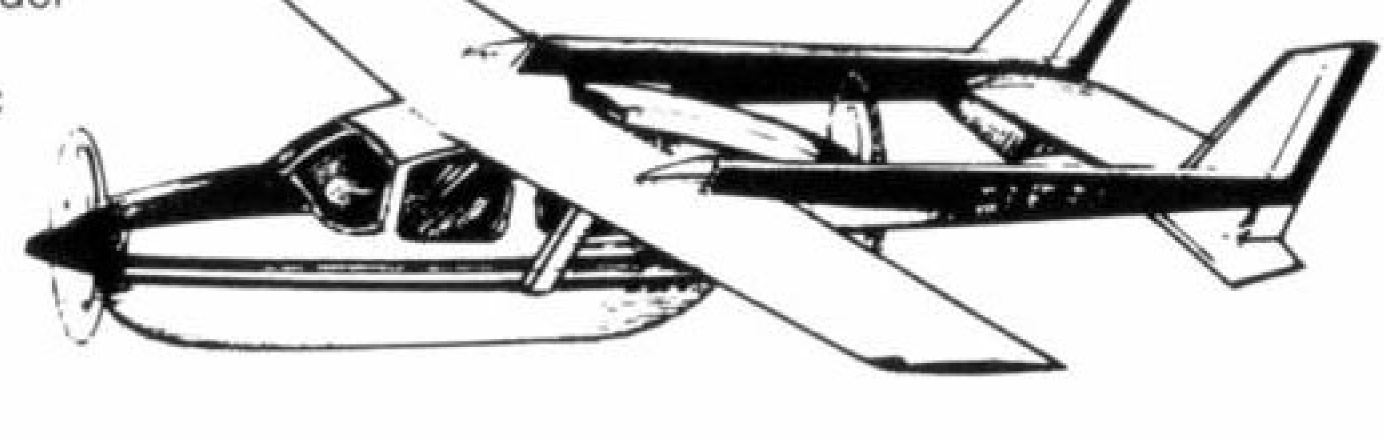
This area contains Stapleton International Airport. Air traffic consists mostly of jet departures and arrivals with some through flights. There are mountains to be avoided here and the weather can be terrible.

D. WASHINGTON, D.C.

This is a very difficult area to control. First, there are two large airports: Dulles International, and Washington National. Secondly, air traffic consists of three different speed classes of aircraft: light planes, jets and the supersonic Concorde. Additionally there is a restricted area over which aircraft are prohibited.

E. NEW YORK, NEW YORK

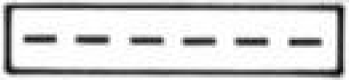
This one will drive you crazy. Balancing the departures and arrivals at the John F. Kennedy International and LaGuardia International airports with the heavy volume of through flights takes tremendous concentration. If you can handle the busy shifts here you should consider becoming a real air traffic controller! (Or maybe you already are one!)



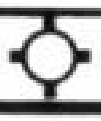
CESSNA SKYMASTER

LEGEND

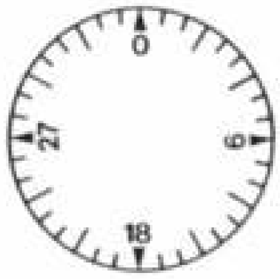
AERODROMES



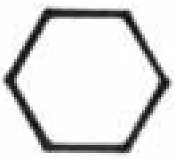
RUNWAY SHAPE



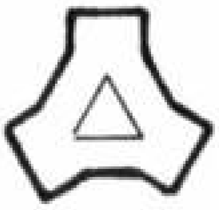
RADIO AIDS TO NAVIGATION



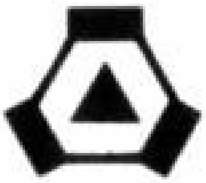
COMPASS ROSE
ORIENTED TO
MAGNETIC NORTH



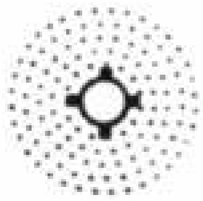
VOR



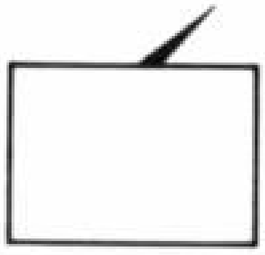
TACAN



VORTAC

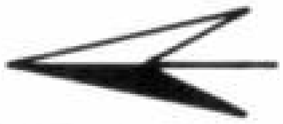
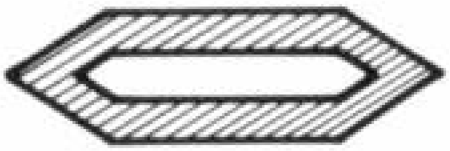


NON-DIRECTIONAL
BEACON



NAVIGATION
AID
IDENTIFIER

AIR TRAFFIC SERVICES AND AIRSPACE INFORMATION

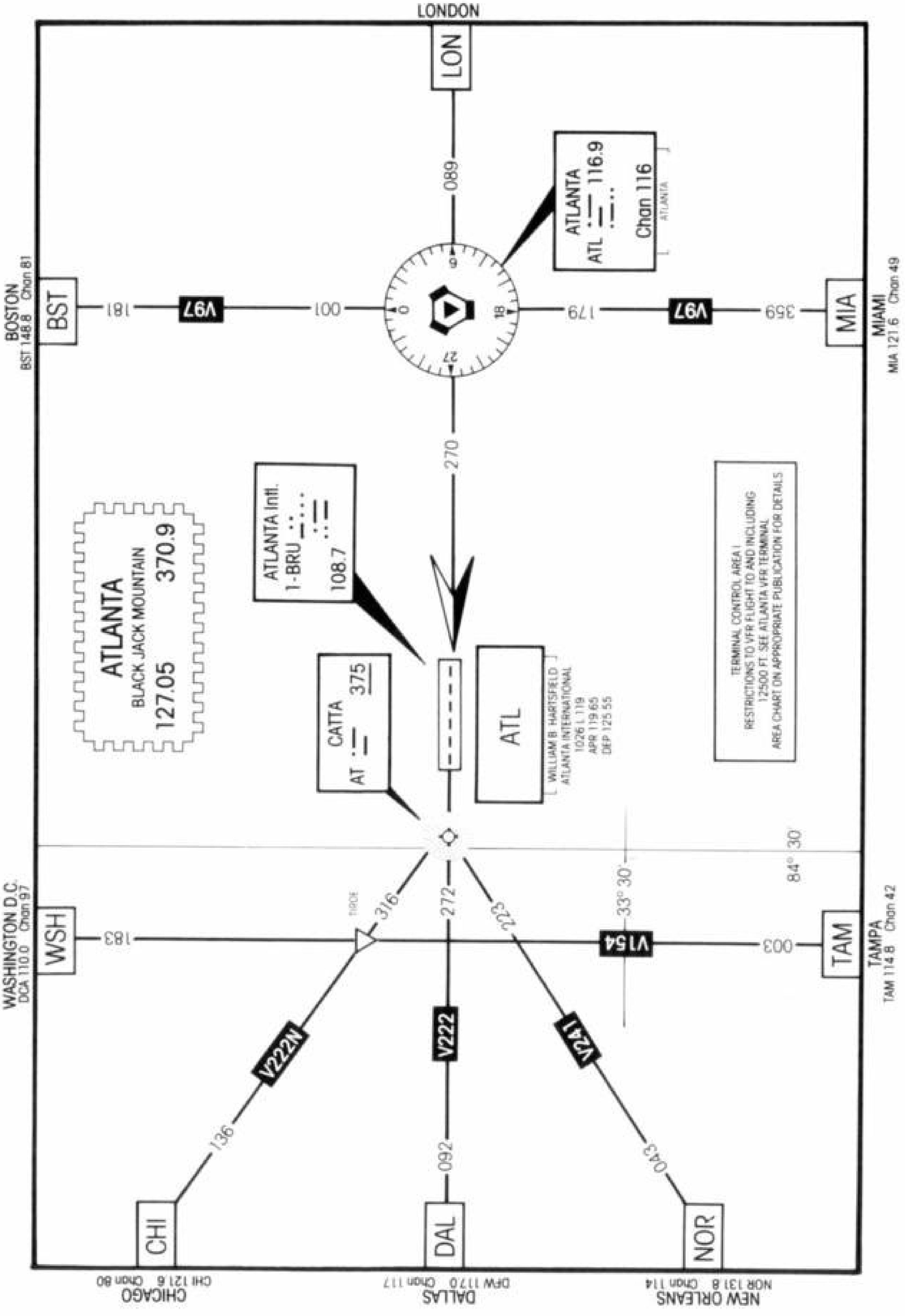
▬▬▬▬	Victor Airways
V438	Airways Identification
	Instrument Landing System
△	Airway Intersection/Non-Compulsory Reporting Point
——133——	**Radial Outboard** for Navigational Aid
77° 30′	**Longitude/Latitude** in Degrees and Minutes
DENVER DEN —·· —· 117.0 Chan 117 DENVER	**Navigational Aid Identifier** **DENVER** — Name; **DEN** — Letter Identifier; — Morse Code for Identifier; 117.0 — VOR Frequency; **Chan 117** — Tacan Channel; **DENVER** — Call Sign of Local Flight Service
DENVER DENVER 126.5 285.5	**Air Traffic Control Center Identifier,** with Sector Name, VHF and UHF Frequency
	**Special Use Airspace** Prohibited, Restricted or Warning Area

IV APPENDIX

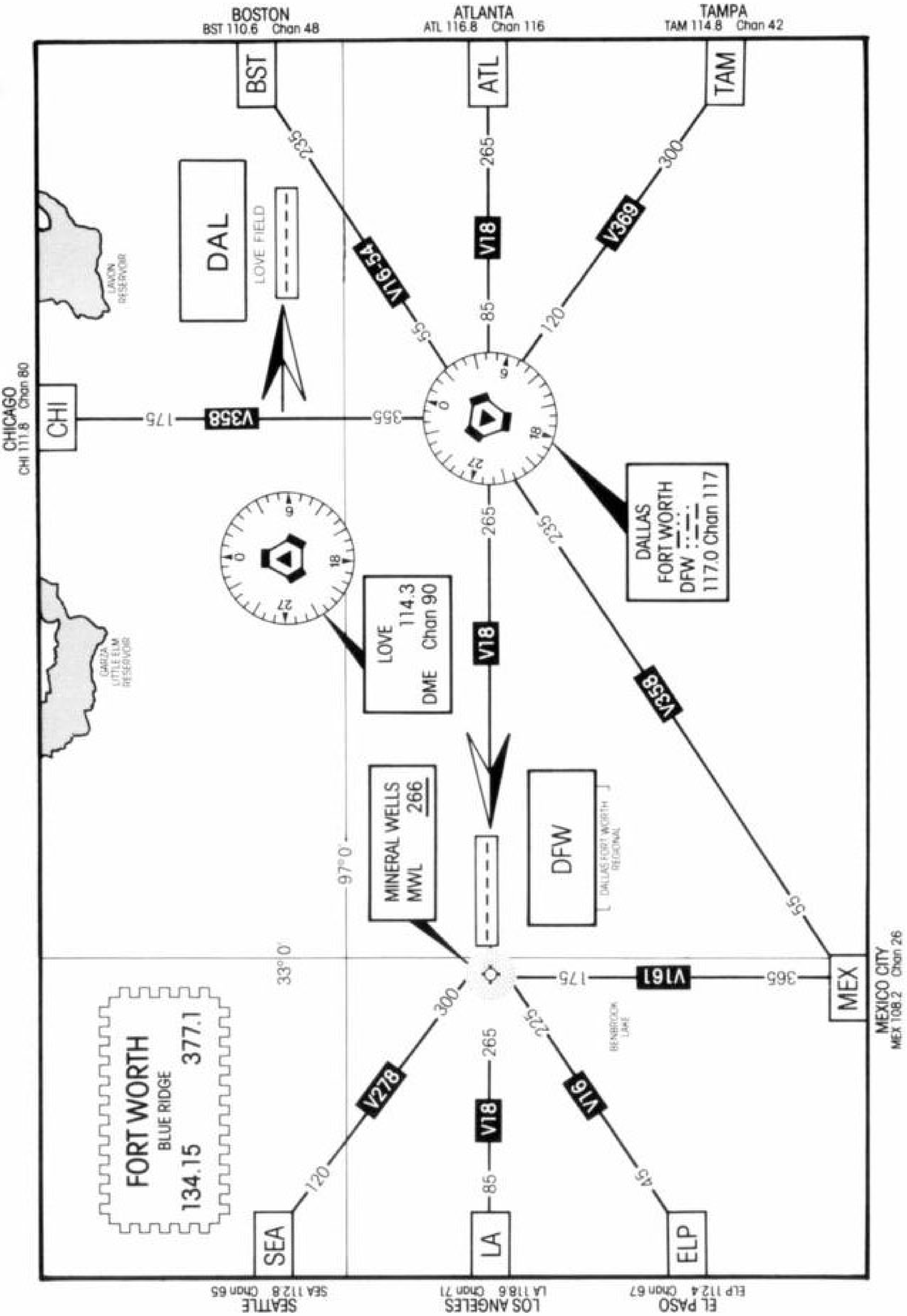
AIR TRAFFIC CONTROL TERMS

ADF	automatic direction finding
AGL	above ground level
ARINC	Aeronautical Radio, Inc.
ASR	airport surveillance radar
ATC	air traffic control
ATIS	automated terminal information service
CDI	course deviation indicator
CRT	cathode ray tube
DF	direction finding
DH	decision height
DME	distance measuring equipment
ELT	emergency locator transmitter
FAA	Federal Aviation Agency/Administration
FAF	final approach fix
FAR	Federal Air Regulations
FSS	flight service station
GCA	ground controlled approach
HAA	height above airport
HAT	height above touchdown
HSI	horizontal situation indicator
IAF	initial approach fix
IAP	instrument approach procedure
ICAO	International Civil Aviation Organization
IFR	instrument flight rules
ILS	instrument landing system
INS	internal navigation system
LORAN	long range navigation
MDA	minimum descent altitude
MSL	mean sea level
NDB	nondirectional beacon
NOTAM	notice to airmen
OCA	oceanic control areas
PAR	precision-approach radar
RNAV	area navigation
SID	standard instrument departure
special VFR	special visual flight rules
SST	supersonic transport
STAR	standard terminal arrival route
STOL	short takeoff and landing
TACAN	Tactical Air Navigation
TCA	terminal control area
TDZ	touchdown zone
UHF	ultra high frequency
VASI	visual-approach slope indicator
VFR	visual flight rules
VHF	very high frequency
VOR	very-high-frequency omnidirectional range
VOR/DME	very-high-frequency omnidirectional range/ distance measuring equipment
VORTAC	ground radio navigation station combining VOR/DME and TACAN
VTOL	vertical takeoff and landing

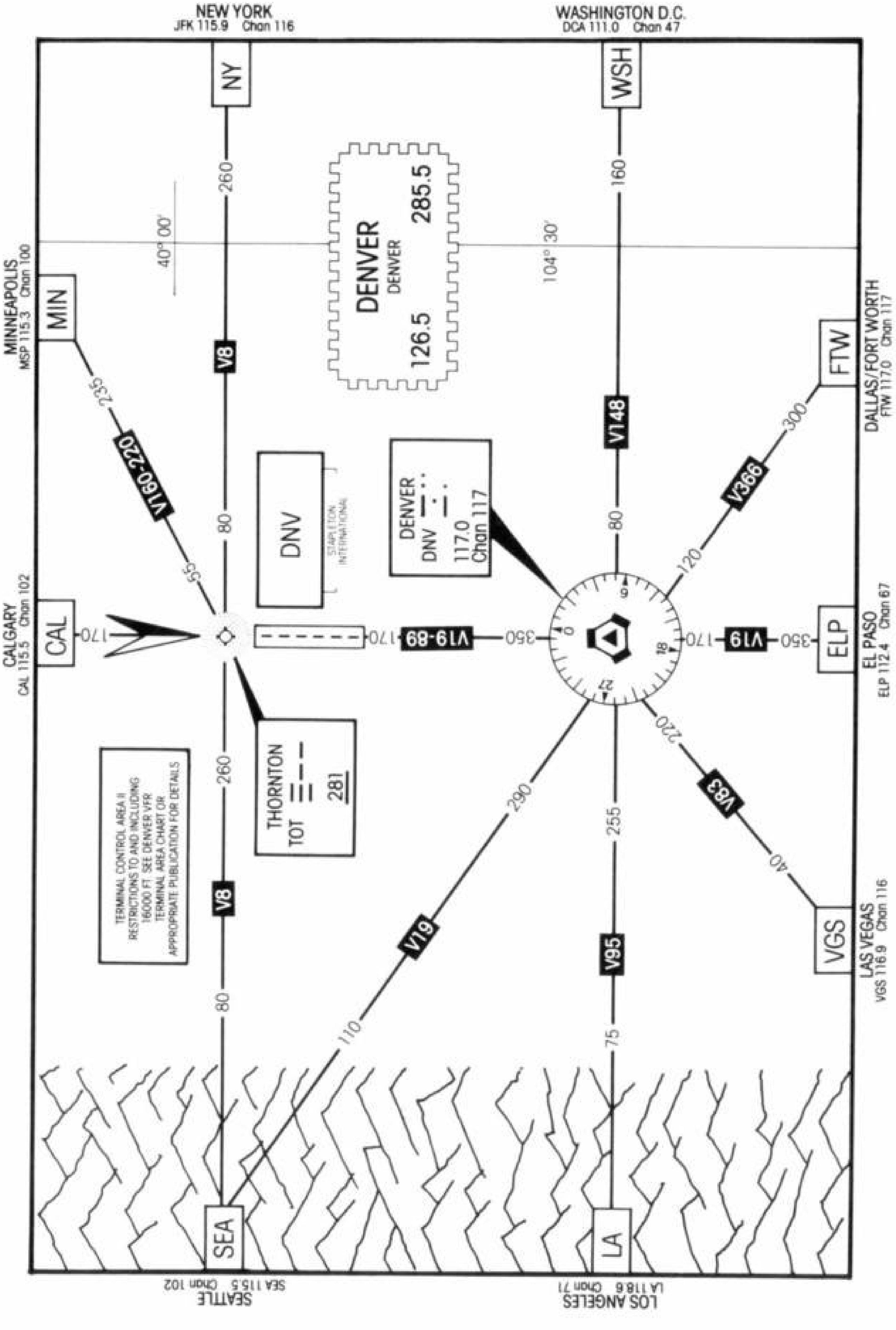
A. ATLANTA TERMINAL CONTROL AREA MAP



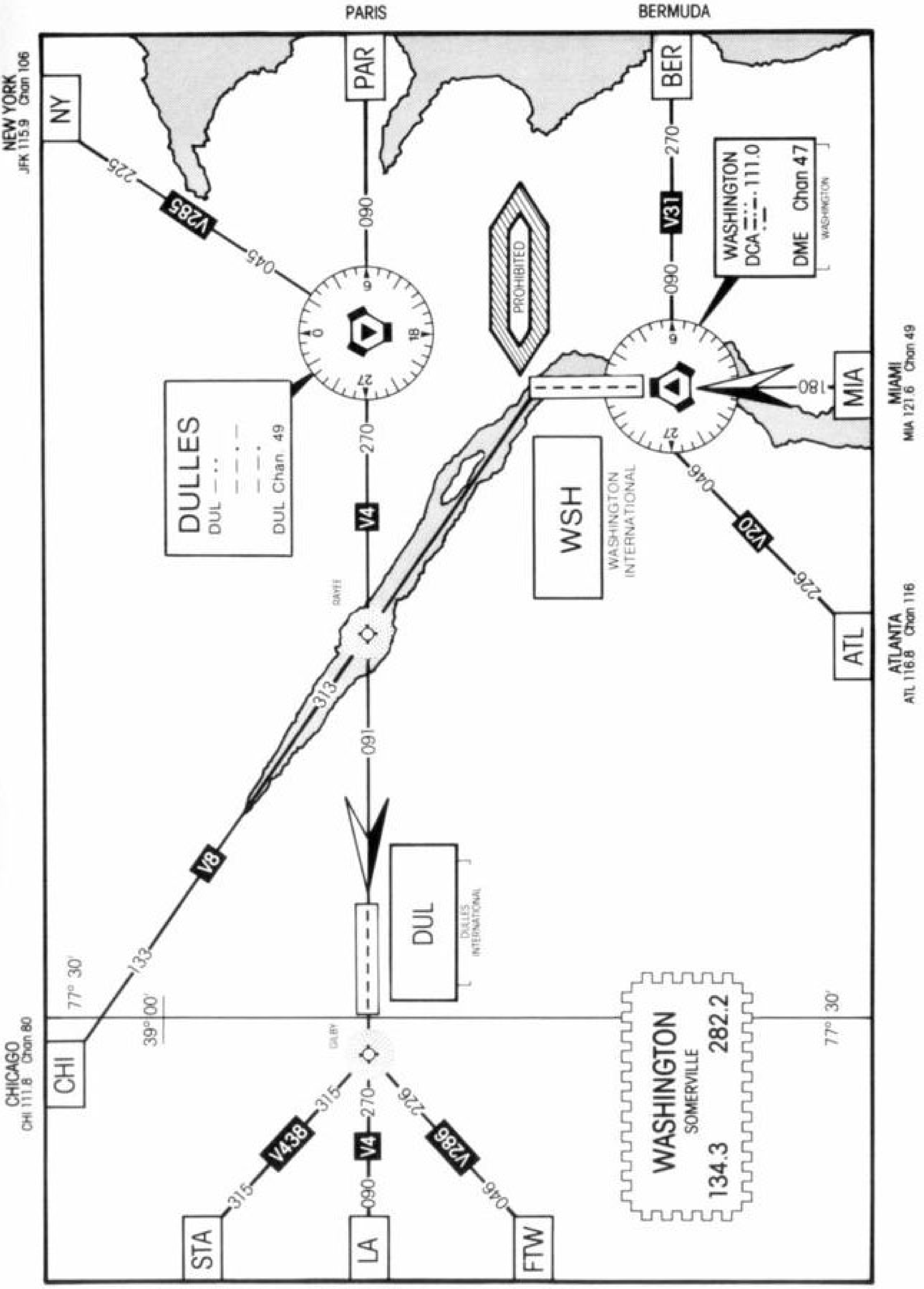
B. DALLAS FORT WORTH TERMINAL CONTROL AREA MAP



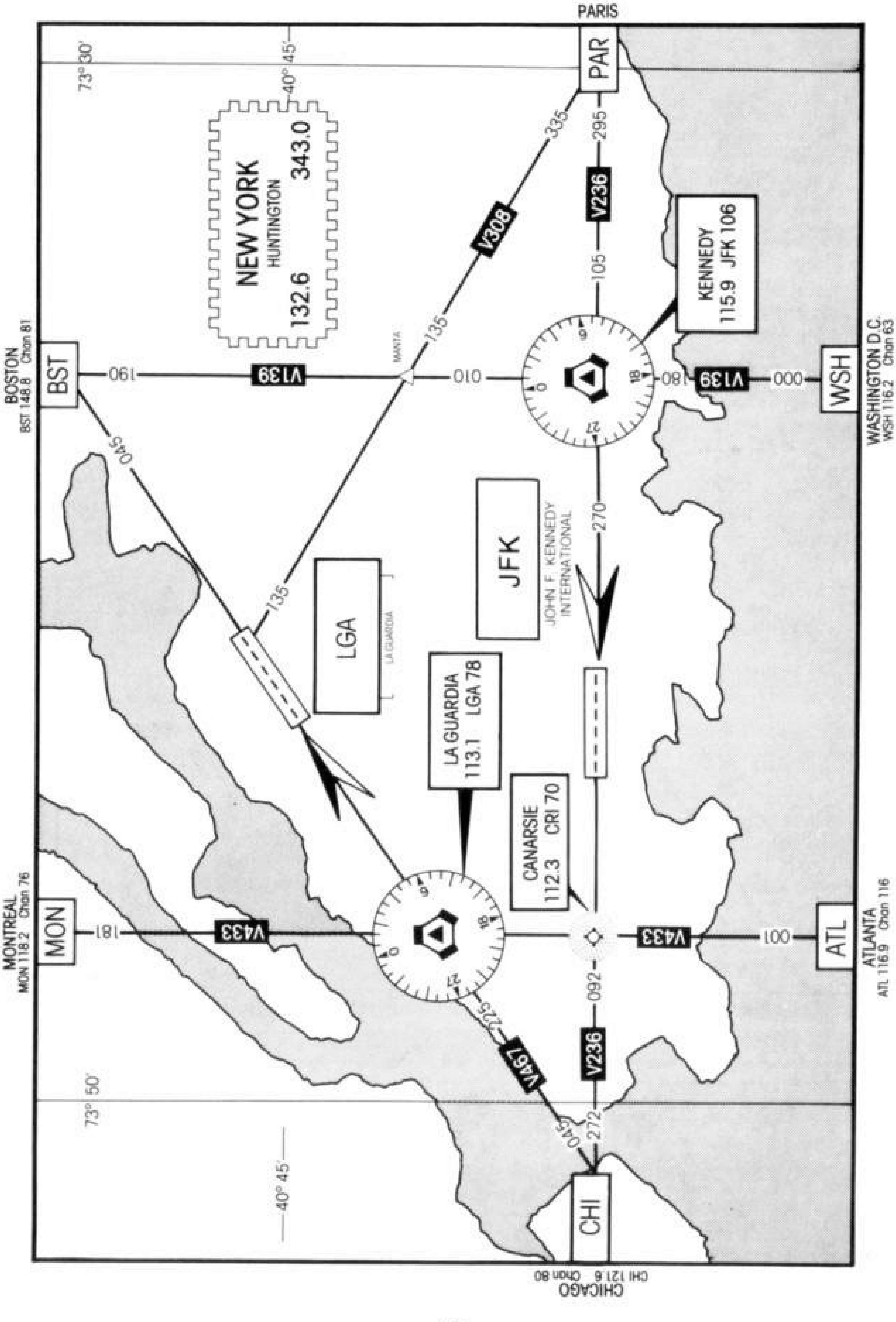
C. DENVER TERMINAL CONTROL AREA MAP



D. WASHINGTON D.C. TERMINAL CONTROL AREA MAP



E. NEW YORK TERMINAL CONTROL AREA MAP



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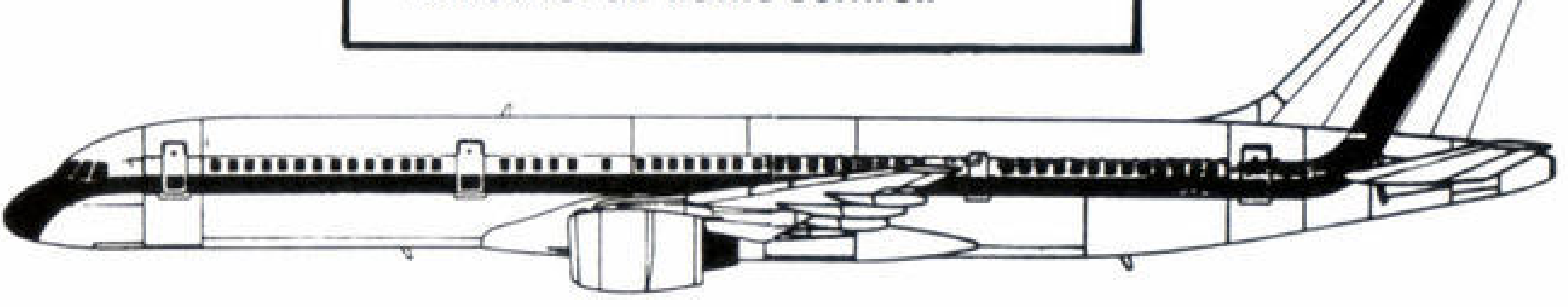
IS AIR TRAFFIC CONTROL FOR YOU?

If you're interested in air traffic control, but have no previous experience, it's important that you visit an air traffic facility near you — more than one, if possible. Because there's a wide variety in work loads; what is a brisk afternoon at one tower, for example, might be a snail's pace at another.

Virtually all controller jobs involve shift work because most facilities operate on a 24-hour basis. The exact rotation of the shift is usually determined by the individual facility, but it could be that you might work several weeks from midnight to 8 a.m. followed by several weeks working from 4 p.m. until midnight. Your days off might not fall on weekends. So if you're a nine-to-five type, you probably aren't suited for air traffic control.



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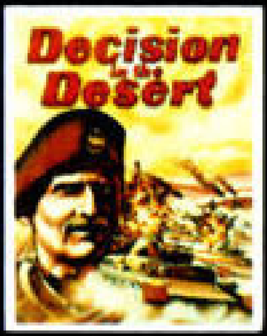
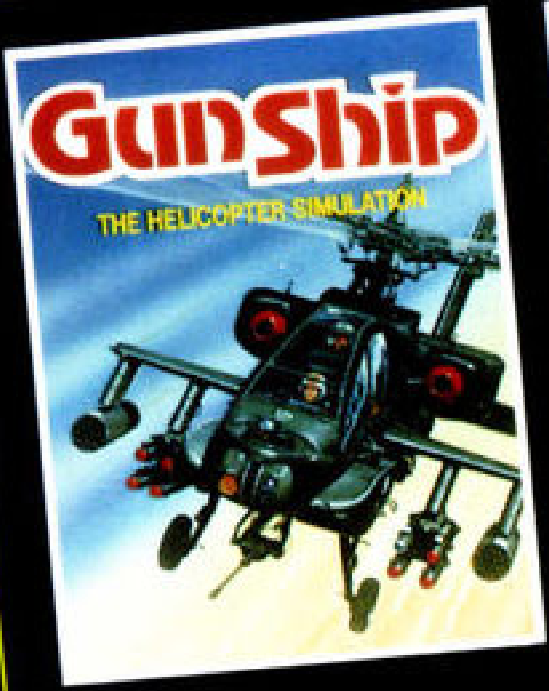


But They Were Wrong... We Did It Again!



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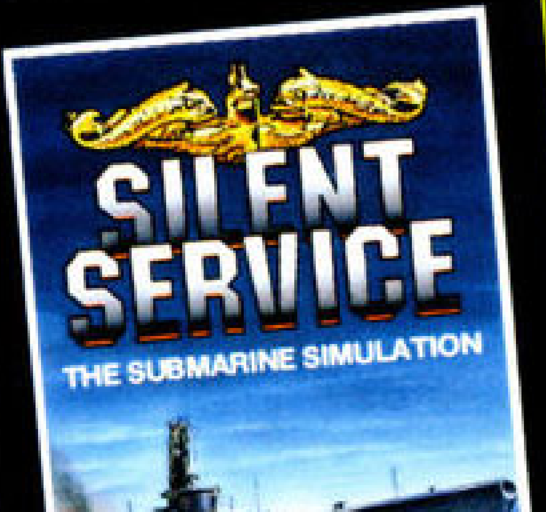

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